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Role of Shrubs in Rangeland Based Livestock Production System in Western Rajasthan, India

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Introduction

Rangeland covers ~ 51% of the terrestrial surface of the Earth, and supports half of the world's livestock. More than 80 % of forage consumed by domestic livestock is supplied by rangelands in Africa and Asia. Hot arid regions of India cover an area of 31.7 million hectares and out of which Rajasthan state constitutes ~ 61.8 % of the entire area. The crop production in this area is low, unstable and risky. Livestock sustains arid farming systems by virtue of their potential to reduce risk, alleviate poverty, important providers of nutrients and traction for growing crops in smallholder systems and the imparting sustainability of household.

The hot arid region of Rajasthan has about 29.08 million livestock. Pastures and grazing lands, residential area and wayside grazing lands, crop by-products and residues, fodder crops etc. are the major feed resources. For the small ruminants and camels, the rangelands are the major source of feed supply. Shrubs are vital component of rangeland vegetation and cover > 70 % of desert landscapes from Aravalli to the international border of the Indian part of Thar desert. They are an important source of feed and assure feed availability in a drought situation. They have remarkable morpho-physiological adaptations to different land forms and survive under harsh edapho-climatic conditions. During recent past, a rapid decline population of browse shrubs is noticed due to their over exploitation, destruction of natural habitat, expending irrigation facilities, increasing agricultural mechanization and changes in land use pattern. In the present paper key species, fodder production and nutritive value of shrubs of hot arid rangelands are discussed.

Materials and Methods

The information have been generated through experiments conducted at Central Arid Zone Research Institute and its Regional Research Stations, and also information gathered during the field visits in the area particularly in Bikaner and Jaisalmer districts of western Rajasthan.

Results and Discussion

Key species: *Acacia jacquemontii, Calligonum polygonoides, Capparis decidua,Clerodendrum phlomidis, Commiphora wightii, Crotalaria burhia, Grewia tenax, Haloxylon salicornicum, H. recurvum, Heliotropium rariflorum, Indigofera oblongifolia, Leptadenia pyrotechnica, Lycium barbarum, Maytenus emarginata, Salsola baryosma, Suaeda fruticosa* and *Ziziphus nummularia etc*. shrub species found in rangelands of hot arid Rajasthan. They occur on diverse habitat/landforms *viz*., sand dunes, sandy plains, interdunal plains, rocky stretches and saline depressions.

Browse and nutritive values: *Acacia jacquemontii* and *Calligonum polygonoides* are two most important browse species of sand dune habitat in the region and provide nutritive feed to livestock and also to wild animals. *A. jacquemontii* locally known as "*Bawli*" is eagerly browsed by camel and goats in its natural occurrence throughout the year particularly in winter when grasses dried up. Its nutritive pods are also eaten by livestock. *C. polygonoides* locally called as "*Phog*" browsed preferably by camel. Its green shoots are also eaten by cattle, sheep and goats during scarcity of feed, however, sheep and goats prefer it in autumn and winter. Dry phylloclades of *C. polygonoides* called "*Lasu*" collected, stored and fed to livestock in the normal and drought conditions. It is supposed good fodder for camel, contains about 7% crude protein and fed after mixing with other feed materials such as straw of *Cyamopsis tetragonoloba* and *Vigna aconitifolia*. Its fruits also form a nourishing feed for milch cattle and camel. *Haloxylon salicornicum* locally called "*Lana*" is well-known browse shrub and camel fodder and its seeds for feeding cattle of the region (Mathur *et al*., 2011). It along with

Lasiurus sindicus and *Panicum turgidum* grasses forms a very productive grazing land system in hot arid region (Shankar and Kumar 1984). Phenology of these two groups of plant appears to complement each other with respect to availability of fodder. Whereas forage from grasses is available during monsoon; the browse from *H. salicornicum* is available during lean period (December-March). Its fruiting tops contain higher protein (14-19%) and minerals (21-24%) than twigs. Livestock keepers harvest its fruiting top during November-December and preserve for further use as fodder. It feds generally after mixed with "*guar phalguti*" (Left over threshed material of *C. tetragnoloba* consisting stover and threshed pods) and "*Lasu*" (phylloclade of *C. polygonoides*). It produces seed (with perianth) up to 3.2 kg plant^{-1}. The seed with perianth contains 18.9 % CP, 13.89% CF, 1.80 % EE, 35.91 % ADF, 71.08 % NDF and 24.70 % ash. Its seed could replace the feed concentrate up to 25 and 50 % in cattle and goat, respectively (Singh *et al*., 2009). *Ziziphus nummularia* locally called as "*Bordi*" is an important leaf fodder shrub species and vital component of the silvi-pastoral system of hot arid region. Its fodder from the dried leaves (known as '*Pala*') is fed to camels, goats, buffaloes and cows. It has high leaf fodder production potential (125 kgha^{-1} of dry leaf) and the combined yield of the leaf fodder and grass to the tune of 1000 kgha^{-1} was reported from the arid scrub grazing lands with its moderate density (14%). It could produce 170 kgha^{-1} fodders in alluvial plain receiving annual rainfall between 250-300 mm. Its leaf fodder contains 11.5 % CP, 33.8 % CF and 80.6 % carbohydrates.

Halophytic chenopod shrubs like *Haloxylon recurvum, Salsola baryosma* and *Suaeda fruticosa* are also important browse resource in saline depressions. They are browsed by camel, goats and also other livestock. Green foliage of *H. recurvum* is rich in CP (13.20%), TCHO (62.9%), CF (20.7%), NDF (58.2%), and ADF (25.2%). It could be fed to goats by mixing with groundnut haulm in 1:3 ratio (Mondal *et al*., 2005). Green foliage of *S. baryosma* also could be used as alternate feed for goats during drought (Mathur *et al*., 2007). The other rangeland shrubs like *Capparis decidua*, *Grewia tenax*, *Heliotropium rariflorum,Indigofera oblongifolia* and *Maytenus emarginata* also need attention for their nutritive browse. The species like *G. tenax* and *I. oblongifolia* have ability to tolerate high browsing pressure in extreme arid condition. Young branches of *C. decidua* are relished by camels and goats particularly during post winter season. *Leptadenia pyrotechnica* is not supposed a browse species, however, browsed by camel and goats in times of drought. Moreover, medicinal species like *Commiphora wightii*, which is threatened species in the region also valued as browse to animals. The climbing shrubs like *Cocculus hirsutus, C. pendulus, Ephedra ciliata etc*. being browsed avidly by grazing animals also need to be maintained in rangelands. The forgoing discussion suggests that shrubs are an important source of feed in hot arid region because of their palatability, good nutritive value and availability in lean period. Shrubs constitute a feed reserve for livestock in periods of inter-seasonal or inter-annual drought in arid region.

Conclusion

Definitely browse from shrubs sustains grazing animals during the lean period when grasses are dried or finished. Shrubs are vital component of natural vegetation in extreme arid situations. In planning the rangeland development programme for livestock production, there is a need of critical data base on key rangelands shrubs of forage importance, browsing behavior of animals, their choice of browse, seasonality of browse and, of course, plant response to animal browsing. Precise data on the ideal plant density and the plant cover for most of the browse shrub species in the rangelands is lacking. Moreover, many of the species are niche specific and show optimum growth in their ideal environment. Therefore, range improvement programme, must also focus on this aspect. Further, there is also need to develop a long term conservation strategy to promote the conservation of rangeland shrub biodiversity and it should be based on understanding the habitat requirements of the species. By conserving and promoting the key rangelands shrubs diversity, certainly support the livestock based farming system in western Rajasthan.

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